

*effecting the expansion of the ice in the smallest degree.* This would of course be still more applicable if we take the mean of the temperatures at Chamouni and the Col du Géant to present the general atmospheric conditions to which the glacier is exposed.

It is in summer that the glacier moves fastest: it is with my observations of motion *in July* that Mr. Moseley compares the results of his theory: and therefore it is of no avail to say that there are periods of the year when congelation penetrates at night some inches, or even it may be some feet into the ice, and when therefore the sensible heat of the glacier may be considered to vary, though, if regard be had to its vast thickness, it must be on an average and in the most extreme circumstances to an absolutely inappreciable degree.

Lastly, Mr. Moseley, whilst condemning in the following passage the theory of glacier motion by the dilatation of water in the interstices of the ice, clearly passes sentence on his own, which could not come into action until the other had already produced its effects: “The theory of Charpentier, which attributes the descent of the glacier to the daily congelation of the water which percolates it, and the expansion of its mass consequent thereon, whilst it assigns a cause which, so far as it operates, cannot, as I have shown, but cause a glacier to descend, appears to me to assign one inadequate to the result; for the congelation of the water which percolates the glacier does not, according to the observations of Professor Forbes, take place at all in summer more than a few inches from the surface. Nevertheless it is in summer that the daily motion of the glacier is greatest.” (Moseley, Proc. R.S. vol. vii. p. 341.)

- II. “Researches on the Foraminifera.—Part I. General Introduction, and Monograph of the Genus *Orbitolites.*” By WILLIAM B. CARPENTER, M.D., F.R.S., F.G.S. &c.  
Received May 21, 1855.

The group of *Foraminifera* being one as to the structure and physiology of which our knowledge is confessedly very imperfect,

and for the natural classification of which there is consequently no safe basis, the author has undertaken a careful study of some of its chief typical forms, in order to elucidate (so far as may be possible) their history as living beings, and to determine the value of the characters which they present to the systematist. In the present memoir, he details the structure of one of the lowest of these types, *Orbitolites*, with great minuteness; his object having been, not merely to present the *results* of his investigations, but also to exhibit the *method* by which they have been attained; that method essentially consisting in the minute examination and comparison of a *large number* of specimens.

The *Orbitolite* has been chiefly known, until recently, through the abundance of its *fossil* remains in the Eocene beds of the Paris basin; but the author, having been fortunate enough to obtain an extensive series of *recent* specimens, chiefly from the coast of Australia, has applied himself rather to these as his sources of information; especially as the *animals* of some of them have been sufficiently well preserved by immersion in spirits, to permit their characters to be well made out.

As might have been anticipated from our knowledge of their congeners, these animals belong to the *Rhizopodous* type; the soft body consisting of *sarcode*, without digestive cavity or organs of any kind; and being made up of a number of segments, equal and similar to each other, which are arranged in concentric zones round a central nucleus. This body is invested by a calcareous shell, in the substance of which no minute structure can be discerned, but which has the form of a circular disk, marked on the surface by concentric zones of closed cells, and having minute pores at the margin. Starting from the central nucleus,—which consists of a pear-shaped mass of sarcode, nearly surrounded by a larger mass connected with it by a peduncle,—the development of the *Orbitolite* may take place either upon a *simple*, or upon a *complex* type. In the former (which is indicated by the *circular* or *oval* form of the cells which show themselves at the surfaces of the disk, and by the *singleness* of the row of marginal pores), each zone consists of but a single layer of segments, connected together by a single annular stolon of sarcode; and the nucleus is connected with the first zone, and each zone with that which surrounds it, by radiating peduncles proceeding from this

annulus, which, when issuing from the peripheral zone, will pass outwards through the marginal pores, probably in the form of *pseudopodia*. In the *complex* type, on the other hand (which is indicated by the *narrow* and *straight-sided* form of the superficial cells, and by the *multiplication* of the horizontal rows of marginal pores), the segments of the concentric zones are elongated into vertical columns with imperfect constrictions at intervals; instead of a single annular stolon, there are two, one at either end of these columns, between which, moreover, there are usually other lateral communications; whilst the radiating peduncles, which connect one zone with another, are also multiplied, so as to lie in several planes. Moreover, between each annular stolon and the neighbouring surface of the disk, there is a layer of superficial segments, distinct from the vertical columns, but connected with the annular stolons; these occupy the narrow elongated cells just mentioned, which constitute two *superficial* layers in the disks of this type, between which is the *intermediate* layer occupied by the columnar segments.

These two types seem to be so completely dissimilar, that they could scarcely have been supposed to belong to the same species; but the examination of a large number of specimens shows, that although one is often developed to a considerable size upon the simple type, whilst another commences even from the centre upon the complex type, yet that many individuals which begin life, and form an indefinite number of annuli, upon the simple type, then take on the more complex mode of development.

The author then points out what may be gathered from observation and from deduction respecting the *Nutrition* and mode of *Growth* of these creatures. He shows that the former is probably accomplished, as in other Rhizopods, by the entanglement and drawing in of minute vegetable particles, through the instrumentality of the pseudopodia; and that the addition of new zones probably takes place by the extension of the sarcodite through the marginal pores, so as to form a complete annulus, thickened at intervals into segments, and narrowed between these into connecting stolons, the shell being probably produced by the calcification of their outer portions. And this view he supports by the results of the examination of a number of specimens, in which *reparation of injuries* has taken place. Regarding the *Reproduction* of Orbitolites, he is only able

to suggest that certain minute spherical masses of sarcode, with which some of the cells are filled, may be *gemmules*; and that other bodies, enclosed in firm envelopes, which he has more rarely met with, but which seem to break their way out of the superficial cells, may be *ova*. But on this part of the inquiry, nothing save observation of the animals in their living state can give satisfactory results.

The regular type of structure just described is subject to numerous *variations*, into a minute description of which the author next enters; the general results being, that neither the shape nor dimensions of the entire disk, the size of the nucleus or of the cells forming the concentric zones, the surface-markings indicating the shape of the superficial cells, nor the early mode of growth (which, though typically *cyclical*, sometimes approximates to a *spiral*), can serve as distinctive characters of *species*; since, whilst they are all found to present most remarkable differences, these differences, being strictly gradational, can only be considered as distinguishing *individuals*. It thus follows that a very wide *range of variation* exists in this type; so that numerous forms which would be unhesitatingly accounted specifically different, if only the *most divergent examples* were brought into comparison, are found, by the discovery of those *intermediate links* which a large collection can alone supply, to belong to one and the same specific type.

After noticing some curious *monstrosities*, resulting from an unusual outgrowth of the central nucleus, the author proceeds to inquire into the *essential character* of the Orbitolite, and its relations to other types of structure. He places it among the very lowest forms of Foraminifera; and considers that it approximates closely to sponges, some of which have skeletons not very unlike the calcareous net-work which intervenes between its fleshy segments. Of the *species* which the genus has been reputed to include, he states that a large proportion really belong to the genus *Orbitoides*, whilst others are but varieties of the ordinary type. This last is the light in which he would regard the *Orbitolites complanata* of the Paris basin; which differs from the fully-developed Orbitolite of the Australian coast in some very peculiar features (marking a less complete evolution), which are occasionally met with among recent forms, and which are sometimes distinctly transitional towards the perfect type.

The author concludes by calling attention to some general principles, which arise out of the present inquiry, but which are applicable to all departments of Natural History, regarding the *kind* and *extent* of comparison on which alone specific distinctions can be securely based.

*June 21, 1855.*

The LORD WROTTESLEY, President, in the Chair.

A. Follett Osler, Esq., Charles Vincent Walker, Esq., and Robert Wight, M.D., were admitted into the Society.

The following gentlemen were elected Foreign Members of the Society :—

Gustav Lejeune Dirichlet.  
 Julius Plücker.  
 Heinrich Rathke.  
 Carl Rümker.

Pursuant to notice given at last Ordinary Meeting, the question of the readmission of Edward Tuson, Esq., was put, and, the ballot having been taken, decided in the negative.

The following communications were read :—

1. “On a supposed Aërolite or Meteorite found in the Trunk of an old Willow Tree in the Battersea Fields.” By Sir RODERICK IMPEY MURCHISON, F.R.S., Director-General of the Geological Survey of Great Britain. Received June 21, 1855.

In bringing this notice before the Royal Society, it is unnecessary to recite, however briefly, the history of the fall of aërolites or meteorites, as recorded for upwards of three thousand years, though I may be